

Book Reviews

Inhalation Studies: Foundations and Techniques. R. F. PHALEN, CRC Press, Boca Raton, FL, 1984, 288 pp. Price: US \$89.00; Foreign \$102.00.

Inhalation Studies: Foundations and Techniques is a book which attempts to draw together the salient points of inhalation hardware and pulmonary toxicology. Although the book suffers from the omission of some important basic information, in general it provides a good background to the fundamentals of inhalation toxicology. The material is well framed and presented as an introductory treatment. The unfortunate exception to this is the first chapter on the physical characteristics of aerosols and gases. The rigorous discourse provided on the physical properties of aerosols and the rate at which the subject is developed reflect the author's extensive background in this area. Although these are important concepts, such a discussion early in the book may discourage those naive to the discipline from reading further. Also, in a discussion of the physical characteristics of inhaled agents it would seem more appropriate to address gaseous agents and to follow this with the complex issues associated with particles. The section on particles, however, does address the significance of their hygroscopic character, electrical charge, and surface properties. These aspects of aerosol technology are frequently not dealt with adequately, and sometimes ignored completely, by investigators conducting such inhalation studies.

Chapter two provides an introduction to the respiratory tract. This chapter is one of the best written and organized in the book. The gross anatomy of the respiratory tract is reviewed with some discussion of species differences. A section on the cells and tissues of the respiratory tract provides balanced treatment of everything from type I pneumocytes to the nervous intervention of the respiratory system. A section on lung function leads appropriately into sections on the deposition of particles and the uptake of gases, but again the aerosol and gas discussions are presented in the contrary order. The chapter closes with a section on respiratory tract defenses, however, it deals only with clearance mechanisms and does not discuss the immunological aspects of lung defense.

The next three chapters are concerned with the technology of exposing animals to inhaled agents. Chapter three, "Establishing and Controlling Exposure Environments," discusses in detail air handling systems for purification of air and regulation of its flow through exposure chambers. A good introduction is provided to aerosol and gas (again in that order) generation systems with liberal references to more detailed information. This chapter is remarkably inconsistent in the use of °C and °F, and I am not certain why the latter is used at all. Also when discussing the absolute water content of air both g/m³ and mg/l are used.

A serious omission occurs in chapter four, "Characterizing the Exposure." Important aspects of chamber performance and exposure characterization are the build up and clearance of the test agent in the chamber after the generation equipment is turned on and off, respectively. These empirically generated curves can be compared to the theoretical to judge the performance of the chamber/generator system, conditioning time of the chamber after start up, and outgassing of test agent from the animals after exposures are terminated. Unfortunately, this aspect of animal exposures is not discussed in these chapters or in any other part of the book. The chapter on exposure methods terminates with a discussion on the use of animals in inhalation studies. I was pleased to find a brief discussion of the humane treatment of laboratory animals in this technical chapter. It is a topic that conscientious scientists appreciate, and an area in which those investigators who are less aware of the welfare of test animals need to be informed.

A variety of endpoints frequently assessed under testing protocols for inhaled toxic agents are addressed in chapter six. Unfortunately, inhalation exposures and subsequent endpoint assessments are not presented as means of investigating the validity of scientific hypotheses but only as testing mechanisms. Missing from the provided menu of pulmonary toxicology tests is the assessment of the chemicals

comprising lung connective tissue, which have proven to be sensitive indicators of early fibrosis. Chapter seven addresses the formidable topic of experimental design. It is discussed in a concise and well balanced manner. A scientific approach to such issues as determining adequate test sample size and assessing the effects of cofactors is provided.

In the chapter on facilities the author's fondness for his home base is supported by a figure of the floor plan of the Air Pollution Health Effects Laboratory at the University of California, Irvine. It appears to be a fine facility. However, a diagram and discussion of an idealized facility incorporating the best aspects of every laboratory with which one is familiar would have been more appropriate. There is no discussion about the facilities necessary to keep animals specific pathogen free and the containment of potentially carcinogenic particles. These are items which must be considered when assessing the overall utility of a state of the art inhalation laboratory. Animal quarters, personnel quarters, laboratory space, and the appropriate expertise and support required to operate an inhalation facility are discussed. Some of these concerns are frequently decided by architects or space committees and this chapter provides formulas to determine the adequacy of the space allocated the investigator.

A chapter on animal models provides information on the appropriate comparative anatomy and physiology of species frequently used in inhalation studies. This reference book must be commended for its liberal use of tables with manageable amounts of cogent information, many of which appear in this chapter.

The final chapter addresses regulations and guidelines and provides the historical background for the implementation of GLPs. The chapter drives home the point that there are regulations and guidelines with which researchers must comply for their work to be scientifically acceptable, for their actions to be ethical, and for the studies to be unencumbered by legal problems. The chapter also includes an extensive list of additional resource material associated with animal care and health.

Overall, the information provided in this volume will complement that found on the bookshelves and the files of most inhalation toxicologists. The index appears comprehensive, a feature which adds value to any reference text. On the negative side, there is a distracting frequency of typographical errors and the relevant text material is peppered with semihumorous minutiae. The major shortcoming is the omission of some pertinent subject material.

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Occupational Lung Disease. J. B. L. GEE, W. K. C. MORGAN and S. M. BROOKS, Raven Press, New York, NY, 1983, 225 pp. Price: \$39.50.

This is a compendium of review papers and research abstracts presented at a symposium on occupational lung diseases, organized by the American College of Chest Physicians assisted by American and Canadian occupational medical groups and the Canadian Thoracic Society. It was funded by several individual corporations, industry associations, and the National Institute of Occupational Safety and Health. Some 270 contributors are listed, including both presentors at the sessions and all co-authors. The book consists of two major parts: a series of 14 chapters most of which represent state-of-the-art reviews of essential principles pertaining to occupational lung disease, and a collection of some 66 abstracts of research papers.

The first chapter is one of the best and deals with deposition and clearance of particulate materials. Deposition has been a subject of investigation and theoretical calculations for many years and the basic mechanisms (impaction, sedimentation and diffusion) were dealt with mathematically at least 30 years ago. However, recent work, especially regarding airway distribution and length, has permitted further refinement of the relevant equations. Clearance too has been studied recently by a variety of new techniques. Thus much of the content of this chapter will probably be new for many readers.